DOCUMENT RESUME

ED 482 464 TM 035 391

AUTHOR	Jiang, Ying Hong; Mok, Doris; Weaver, Robert R.
TITLE	Predicting Kindergarten Success for Economically Disadvantaged Head Start Children: A Latent Curve Analysis.
PUB DATE	2003-04-21
NOTE	14p.; Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, IL, April 21-25, 2003).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*Academic Achievement; *Economically Disadvantaged; Grade 1; Kindergarten; *Kindergarten Children; Longitudinal Studies; *Prediction; Success
IDENTIFIERS	Latent Growth; *Project Head Start

ABSTRACT

The purpose of this study was to use data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 database for public use (version 2.9.2.1; Westat, 2000) to examine a sample of Head Start children and families to predict kindergarten and first grade success, The study controlled family variables of income level, family structure, and parent education level while predicting kindergarten and first grade success. Both repeated measures analysis of variance and latent curve analysis (LCA) were used to predict the academic success of kindergarten and first grade children. Results show that both income level and parent education level had statistically significant ($p<0.05$) effects on reading, mathematics, and general knowledge item response theory (IRT) scale scores, while family structure had a much weaker effect (nonsignificant) on reading, mathematics, and general knowledge IRT scale scores. Further, the means of Head Start children from families at or above the poverty level were consistently higher than those of children from families below the poverty level. The study compared LCA model fit statistics for the models tested. The growth model used for reading appears to provide the best-fit statistics. The growth model for knowledge provides the second best-fit statistics. The growth model for mathematics fit well overall, although the fit statistics are not as ideal as the reading and knowledge growth models. More studies need to be done in that area. (Author/SLD)

Reproductions supplied by EDRS are the best that can be made
from the original document.

Predicting Kindergarten Success for Economically Disadvantaged Head Start Children:

A Latent Curve Analysis

ED 482 464

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

Y. H. Jiang

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Ying Hong Jiang

Doris Mok

Robert R. Weaver

Azusa Pacific University

TM035391

BE[illegible]PY AVAILAB[illegible]

Paper Presented at the Annual Meeting of American Educational Research Association, 2003, Chicago

Abstract

The purpose of this study is to utilize data from Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (ECLS-Kindergarten-First Grade) database for public use version 2.9.2.1 (Westat, 2000) to examine a sample of Head Start children and families to predict kindergarten and first grade success. More specifically, the study controls family variables of income level, family structure, and parent education level while predicting kindergarten and first grade success for Head Start children. Both repeated measures ANOVA and Latent Curve Analysis (LCA) were employed to predict the academic success of kindergarten and first grade children. Results show that both income level and parent education level had statistically significant ($p < .05$) effects on reading, math, and general knowledge IRT scale scores, while family structure had a much weaker effect (non-significant) on reading, math, and general knowledge IRT scale scores Further, the means of Head Start children from families at or above the poverty level were consistently higher than children from families below the poverty level. The study compares LCA model fit statistics for the models tested. The growth model for reading appears to provide the best-fit statistics. The growth model for knowledge provides the second best-fit statistics. The growth model for math fit well overall, although the fit statistics are not as ideal as the reading and knowledge growth models. It is recommended more studies need to be done in that direction.

Introduction and purpose of the study:

For the year 2000, the total enrollment of Head Start reached 857,664 with a budget of $5,266,211,000. It is noted that 69% of children enrolled in Head Start are minority children, with 34.5% being black, and 28.7% being Hispanic (Head Start Bureau, 2001). This figure is likely to rise reflecting the trends of the US national population. There is an increasing awareness that research should acknowledge the demographic diversity, social changes and address specific community needs (Takanishi & DeLeon 1994; Zigler & Styfco, 1994). In recent years, the program has been challenged to demonstrate its effectiveness through rigorous research. The Advisory Committee on Head Start Research and Evaluation Committee was established in 1998 to provide recommendations for national analysis of the impact of Head Start. Some of the recommendations include random assignment of children and families, diversity of sites, quality of sites, and outcome measurement focusing on multiple domains (Head Start Bureau, 1999).

The purpose of this study is to utilize data from a national longitudinal study to examine a sample of Head Start children and families. More specifically, the current study intends to control several family variables such as income level, family structure, and parent education level while predicting kindergarten and first grade success for Head Start children.

Related literature on predictors of academic growth

A number of studies have sought to predict academic growth using income, parent education, and family structure as risk predictors. Income (Patterson, Kupersmidt, & Vaden, 1990; Entwisle & Alexander, 1990) and SES (Walker, Greenwood, Hart, & Carta, 1994) have predicted substantial variance in academic outcomes. Parent education (Greenberg, Lengua, Coie, & Pinderhughes, 1999; Walker et al.) has been associated with reading achievement. Race (Greenberg, et al.), SES, early language development, and IQ (Walker, et al.) are other predictors of primary level reading achievement. A variety of predictors including specific demographic factors (number of siblings, mother's age at the child's birth, family structure), life stress, family expressiveness (Greenberg, et al.), parent expectations, parent education, and kindergarten experience (Entwisle & Alexander) have accounted for math achievement. Family structure may not be good indicator of academic achievement because it does not necessarily indicate the level of involvement of fathers or other significant males in the lives of children (Fagan, Newash & Schloesser, 2000).

In the current study, we would expect income level to relate to all three academic achievement measures, and parent education to predict reading, but not necessarily math. Family structure may relate to any of the three academic achievement outcomes in the absence of more discriminating predictors.

Data source

Data for this study comes from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (ECLS-Kindergarten-First Grade) database for public use version 2.9.2.1 (Westat, 2000). The database contains a nationally representative sample of 17,212 children enrolled in about 1,000 kindergarten programs. It includes information about the child, the child's parents/family, teachers, and schools. The design of the study allows for the examination of the

interaction of a variety of individual and familial characteristics as well as environmental factors such as school and community. We are particularly interested in effects from family variables on Head Start children's academic growth. The predictor variables of our particular interests are income level, parent education level, and family structure. The outcome variables are three repeated cognitive measures that were made during kindergarten and first grade, namely, a) the Reading IRT scale score, b) the Math IRT scale score, and c) the General Knowledge IRT scale scores. These measures have been collected longitudinally at four data points, Fall 98, Spring 99, Fall 99, and Spring 2000. We excluded Fall 99 data, because only 30 % of sample was tested.

Variables and Sample

In this study, the indicator of income level used is WKPOV_R, "poverty level revised." This variable has two levels representing two distinctive groups: a) Head Start children from families below poverty level and b) Head Start children from families at or above poverty level. The indictor of parent education level used is W1PARED, "parent highest education level." This variable has nine levels representing nine different categories of highest education level attained: a) 8th grade or below, b) 9th -12th grade, c) high school diploma/equivalent, d) vocational/technical program, e) some college, f) bachelor's degree, g) graduate/professional school-no degree, h) master's degree (MA, MS), and i) doctorate or professional degree. The indicator of family structure used describes the parent/guardian pattern of the household. This variable has nine levels: a) Biological mother and biological father, b) biological mother and other father, c) other mother and biological father, d) biological mother only, e) biological father only, f) two adoptive parents, g) one adoptive parent and one step parent, h) related guardians, and i) unrelated guardians. The sample for this study includes 1,930 Head Start children who had no missing data for the three indicator variables.

Data analyses and results

The major purpose of the study is to model Head Start children's academic growth from kindergarten through first grade in the domains of reading, math and general knowledge, while controlling family variables such as income level, parent education level, and family structure. We used the original weight variable C124CW0 to create a new weight to normalize the weights so that they sum to the sample size in the data set (rather than the population of kindergarten children by applying the formula 'New Weight = (C124CW0 * n) /sum(C124CW0)'. The new weight then was applied to all the analyses in the study.

There were two phases for the data analyses. In the first phase, we conducted three conventional Repeated Measures Analyses of Variance. The analyses were done using income level as the grouping variable and parent education level and family structure as covariates. Three repeated measures for Reading, Math, and General Knowledge IRT scale scores collected from kindergarten (Fall 98, Spring 99) and first grade (Spring 2000) were used. In the second phase of data analyses, we conducted three latent curve analyses to model Head Start children's academic growth measures using Reading, Math, and General Knowledge IRT scale scores collected from kindergarten (Fall 98, Spring 99) and first grade (Spring 2000), while controlling for poverty level, parent education level, and family structure.

Repeated Measures ANOVAs

The results from the Repeated Measures ANOVAs show that both income level and parent education level had statistically significant ($p < .05$) effects on reading, math, and general knowledge IRT scale scores, while family structure had a much weaker effect (non-significant) on

reading, math, and general knowledge IRT scale scores (Tables 1, 2, and 3). Further, the means of Head Start children from families at or above the poverty level were higher than children from families below the poverty level (Tables 4, 5, and 6).

Figures 1, 2, 3 in Appendix A plot the growths of Reading, Math, and General Knowledge based on the estimated means from three data points: Fall 98, Spring 99, and Spring 2000. We have observed the trend for an overall higher gain from Spring 99 to Spring 2000 compared with the gain from Fall 98 to Spring 99. This appears to indicate that the rate of change is different for these two periods. This effect may be due to the longer period from Spring 99 to Spring 2000.

Table 1: Summary Table of Tests of Between-Subjects Effects on Repeated Measures of Reading IRT Scale Score

Source	SS	df	MS	F	p	Eta Squared
Intercept	399641.043	1	399641.043	1995.556	<.01	.534
Family Structure	124.411	1	124.411	.621	.431	.000
Parent Education Level	11495.660	1	11495.660	57.402	<.01	.032
Poverty Level	11131.685	1	11131.685	55.585	<.01	.031
Error	349062.710	1743	200.265			

Table 2: Summary Table of Tests of Between-Subjects Effects on Repeated Measures of Math IRT Scale Score

Source	SS	df	MS	F	p	Eta Squared
Intercept	320643.340	1	320643.340	2585.524	<.01	.579
Family Structure	166.277	1	166.277	1.341	.247	.001
Parent Education Level	6891.815	1	6891.815	55.573	<.01	.029
Poverty Level	4493.229	1	4493.229	36.231	<.01	.019
Error	232899.831	1878	124.015			

Table 3: Summary Table of Tests of Between-Subjects Effects on Repeated Measures of General Knowledge IRT Scale Score

Source	SS	df	MS	F	p	Eta Squared
Intercept	215727.274	1	215727.274	2094.271	<.01	.547
Family Structure	335.559	1	335.559	3.258	.071	.002
Parent Education Level	7055.377	1	7055.377	68.493	<.01	.038

BEST COPY AVAILABLE

Poverty Level	5598.503	1	5598.503	54.350	<.01	.030
Error	178925.404	1737	103.008			

Table 4: Means and Standard Deviations of Reading IRT Scale Score for Head Start Children by Poverty Level

Measures	Group	Mean	Std. Deviation	n
FALL 98 READING	IRT SCALE SCORE	Below Poverty and Head Start		18.06213
	4.98720	820		
	At or Above Poverty and Head Start		20.38861	6.83918
	927			
	Total	19.29661	6.15002	1747
SPRING 99 READING	IRT SCALE SCORE	Below Poverty and Head Start		27.10140
	7.85989	820		
	At or Above Poverty and Head Start		30.55024	9.83005
	927			
	Total	28.93143	9.12089	1747
SPRING 2000 READING	IRT SCALE SCORE	Below Poverty and Head Start		46.65681
	12.66391	820		
	At or Above Poverty and Head Start		52.51253	13.05697
	927			
	Total	49.76399	13.19809	1747

Table 5: Means and Standard Deviations of Math IRT Scale Score for Head Start Children by Poverty Level

Measures	Group	Mean	Std. Deviation	n
FALL 98 MATH IRT	SCALE SCORE	1.00 Below Poverty and Head Start		
	15.40524	4.87403	919	
	2.00 At or Above Poverty and Head Start		17.40988	5.71150
	963			
	Total	16.43099	5.41129	1882
SPRING 99 MATH IRT	SCALE SCORE	1.00 Below Poverty and Head Start		
	22.40912	7.15077	919	
	2.00 At or Above Poverty and Head Start		25.20204	7.67418
	963			
	Total	23.83822	7.55148	1882
SPRING 2000 MATH	IRT SCALE SCORE	1.00 Below Poverty and Head Start		
	37.75367	9.09779	919	
	2.00 At or Above Poverty and Head Start		40.44993	8.74689
	963			
	Total	39.13332	9.01891	1882

Table 6: Means and Standard Deviations of General Knowledge IRT Scale Score for Head Start Children by Poverty Level

Measures	Group	Mean	Std. Deviation	n
FALL 98 KNOWLEDGE	IRT SCALE SCORE	Below Poverty and Head Start		16.81738
	5.73225	818		
	At or Above Poverty and Head Start		19.46775	6.13883
	923			
	Total	18.22249	6.09492	1741

BEST COPY AVAILABLE

SRPING 99 KNOWLEDGE IRT SCALE SCORE			Below Poverty and Head Start	
	21.51420	6.42521	818	
	At or Above Poverty and Head Start		24.39060	6.76784
	923			
	Total	23.03914	6.76143	1741
SRPING 2000 KNOWLEDGE IRT SCALE SCORE			Below Poverty and Head Start	
	29.11585	7.08258	818	
	At or Above Poverty and Head Start		32.23758	6.68517
	923			
	Total	30.77085	7.04725	1741

Latent Curve Analyses

After analyzing the findings from the conventional Repeated Measures ANOVAs, we attempted to conditionally model the growths of Head Start children in reading, math, and general knowledge ability (measured by IRT scale scores collected Fall 98, Spring 99, and Spring 2000), while controlling for income level, parent education level, and family structure, we used MPLUS Version 2.12, (Muthen & Muthen, 2002) to conduct Latent Curve Analysis (LCA). According to Curran (2000), latent curve analysis is a highly structured type of structural equation model, since it incorporates information about both covariance and mean structures of observed measures. LCA uses the observed repeated measures to define one or more underlying latent growth factors. Figures 4, 5, and 6 in Appendix A describe the models with path coefficients tested with LCA.

The three LCAs have yielded different findings to describe the growths in three different subject areas. If we fix the intercepts at three data points (Fall 98, Spring 99, and Spring 2000) as 1, and fix the rate of change for the first data point as 0, and the second data point as 2, the rate of change at the third data point varies for the three subject areas. The rate of change is 3.3 for reading, 3.1 for math, and 2.6 for general knowledge. Further, the dummy coded ('1' for below poverty level, '0' for at or above poverty level) income level variable had a negative effect on the intercepts, suggesting that the below poverty level characteristic inversely influenced the intercepts.

BEST COPY AVAILABLE

Apparently the below poverty level characteristic had the strongest negative effect (-3.313) on the knowledge intercept, second strongest negative effect (-3.283) on the reading intercept, and weakest negative effect (-2.083) on the math intercept. Parent education level, however, had a positive effect on all the three intercepts. The values reflect the positive effect of the higher parent education level, since parent education level has been coded with higher value reflecting higher level of parent education. It appears that parent education level had the strongest effect on the reading intercept (.954), the second strongest effect on the knowledge intercept (.935), and the weakest effect on the math intercept (.569). Family structure had a relatively weaker effect on the three intercepts (.608, .06, and 0.396 for reading, math, and general knowledge, respectively).

Income level showed a negative effect on the rate of change for reading (-.807). Parent education level showed weak positive effect on the rate of change for math (.174). Other effects on the rate of change were small.

Table 7, in Appendix B, compares model fit statistics for the models tested. The growth models for reading appear to provide the best-fit statistics. The growth models for knowledge provide the second best-fit statistics. The growth models for math fit well overall, although the fit statistics are not as ideal as the reading and knowledge growth models.

Discussion and educational significance of the study

We have attempted to model Head Start children's growth in the areas of reading, math, and general knowledge, while controlling the family variables of income level, parent education level, and family structure. We recommend that when predicting academic success longitudinally, we need to control for the family variables, which have been theorized to contribute to academic growth. We further recommend the need to look at specific domains where the Head Start program has been effective in helping economically disadvantaged children. One of the findings of the

current study is that the growth model for math does not fit as well as the growth models for reading and knowledge. The implication is the model might have excluded some important family variables or intervention variables. We suggest that further research in the direction.

References

Curran, P. J. (2000). A latent curve framework for studying developmental trajectories of adolescent substance use. In J. Rose, L. Chassin, C. Presson, & J. Sherman (Eds.), Multivariate Applications in Substance Use Research, (pp. 1-42). Hillsdale, NJ: Erlbaum.

Entwisle, D. R., & Alexander, K. L. (1990). Beginning school math competence: Minority and majority comparisons. Child Development, 61, 454-471.

Fagan, J., Newash, N., & Schloesser, A. (2000). Female caregivers' perceptions of fathers' and significant adult males' involvement with their Head Start children. Families in Society, 81, 186-196.

Greenberg, M. T., Lengua, L. J., Coie, J. D., & Pinderhuges, E. E. (1999). Predicting developmental outcomes at school entry using a multiple-risk mode: Four American communities. Developmental Psychology, 35, 403-417.

Patterson, C. J., Kupersmidt, J. B., & Vaden, N. A. (1990). Income level, gender, ethnicity, and household composition as predictors of children's school-based competence. Child Development, 61, 485-494.

Takanishi, R & DeLeon P. H. (1994). A Head Start for the 21 Century. American Psychologist, 49, 120-122.

Walker, D., Greenwood, C., Hart, B., & Carta, J. (1994). Prediction of school outcomes based on early language productions and socioeconomic factors. Child Development, 65, 606-621.

West, Jerry (1997). Formulating a design for the ECLS: Review of longitudinal studies. NCES Working paper series, No. 97-24

Zigler, Styfoe (1994). Head Start: Criticisms in a constructive Context. American Psychologist, 49, 127-132.

Table 7: Comparisons of Model Fit Indices

	Reading Growth Model By Group	Reading Growth Model By Group * Parent Education	Reading Growth Model By Group * Type of Family	Reading Growth Model By Group * Parent Education * Type of Family
Tests of Model Fit	N=1930	N=1930	N=1930	N=1930
$\chi 2$	1.337	1.345	1.472	1.479
df	2	3	3	4
p	0.5093	0.7179	0.6882	0.8302
CFI/TLI	1.000/1.000	1.000/1.002	1.000/1.000	1.000/1.002
RMSEA	0.000	0.000	0.000	0.000
	Math Growth Model By Group	Math Growth Model By Group * Parent Education	Math Growth Model By Group * Type of Family	Math Growth Model By Group * Parent Education * Type of Family
Tests of Model Fit	N=1930	N=1930	N=1930	N=1930
$\chi 2$	21.829	21.849	24.76	24.786
df	2	3	3	4
p	0.000	0.0001	0.000	0.0001
CFI/TLI	0.994/0.983	0.995/0.984	0.994/0.981	0.994/0.982
RMSEA	0.072	0.057	0.061	0.052
	Knowledge Growth Model By Group	Knowledge Growth Model By Group * Parent Education	Knowledge Growth Model By Group * Type of Family	Knowledge Growth Model By Group * Parent Education * Type of Family
Tests of Model Fit	N=1930	N=1930	N=1930	N=1930
$\chi 2$	5.209	8.105	6.421	9.363
df	2	3	3	4
p	0.0725	0.0435	0.0922	0.0524
CFI/TLI	0.999/0.998	0.999/0.997	0.999/0.998	0.999/0.997
RMSEA	0.029	0.030	0.024	0.026

BEST COPY AVAILABLE

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

TM035391

I. DOCUMENT IDENTIFICATION:

Title: Predicting Kindergarten Success for Economically Disadvantaged Head Start Children: A Latent Curve Analysis	
Author(s): Ying Hong Jiang, Doris Mok, Robert R. Weaver	
Corporate Source:	Publication Date: 04/21/2003

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

Level 1

☑

Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) and paper copy.

The sample sticker shown below will be affixed to all Level 2A documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2A

Level 2A

☐

Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only

The sample sticker shown below will be affixed to all Level 2B documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2B

Level 2B

☐

Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Signature:	Printed Name/Position/Title: Ying Hong Jiang	
Organization/Address: Azusa Pacific University 901 E. Alosta Ave, Azusa, CA 91702	Telephone:	FAX:
	E-Mail Address: yhj@apu.edu	Date: 11/06/2003

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, or, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:
Address:
Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant this reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:
Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:

ERIC Clearinghouse on Assessment and Evaluation
University of Maryland, College Park
1129 Shriver Lab
College Park, MD 20742